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MAP **HOBBY MAGAZINE**

FRONT COVER

This pretty little model is a scale free flight Nieuport 17 by Bruno Markiewicz of Detroit, U.S.A. It won the Open Free Flight Scale at the 1964 U.S.A. National Model Flying Championships. See the British National Championships in this issue.

NEXT MONTH

Next month's magazine will feature a Tri-ang Hornby layout cover with a special four page feature "Building a OO Gauge Layout on a Tight Budget", we know this feature will be a great help to many readers. The Full size plane is for a scale conversion slide rule, of all balsa construction. Watch out for part two of the Supermodel feature and many new Meccano models to build. A.B.C. of Model Railways, Great Engineers and all the other regulars will be included as usual together with Militaria and Battle.

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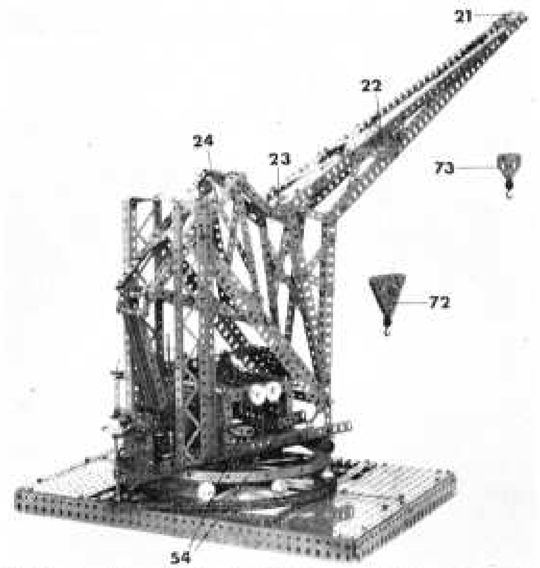
13-35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTFORDSHIRE



First featured in the March 1925 issue of Meccano Magazine and subsequently described in pre-war Super Model Leaflet No. 28, this giant Pontoon Crane has been re-built for today's readers.

NEW 40-YEAR OLD MODEL

by Spanner

A giant Pontoon Crane rebuilt from the March 1925 issue of Meccano Magazine for advanced model builders.

MECCANO MAGAZINE has been published now for more than half a century, during which time literally thousands of new Meccano models of all shapes and sizes have been featured. Meccano, itself, has been on the market even longer—some 60 years—and so, as Meccano is a life-long hobby for many people, there are innumerable adult enthusiasts throughout the world who have seen or possibly even built lots of the models we have presented in the past.

Because of this we have always been a bit wary about giving a second showing of some of the old models for the benefit of newer readers, but we have recently been rather surprised by the large number of requests we have had from the same adult readers asking us to reproduce some of the old advanced models not only for the benefit of newer readers, but also because they would like to see them again, themselves. In response to these requests, therefore, our model-builder has delved 43 years back into our history and come up with this Pontoon Crane, originally featured in the March 1925 issue of the M.M. It was also described in No. 28 of the famous series of pre-war Super Model Leaflets but, despite its age, it can still be built with standard Meccano parts included in the current system, although our builder has made one or two modifications.

Owing to circumstances, it will be necessary for me to re-write the actual building instructions, but before doing so, I think it would be interesting to reprint, word for word, the introduction to the original article. I found it interesting as well as informative and I hope you will do so too.

"Elsewhere in these pages," it says (referring to the 1925 magazine, not this one), "Mention is made of 'Crane Lighter No. 4,' the immense Pontoon Crane belonging to the British Admiralty, which was illustrated and described in the "Meccano Magazine" for September 1921. This crane has been carefully copied in the accompanying model, and the result must undoubtedly be considered as yet another splendid Meccano achievement.

Before proceeding with our description of the model it would be of service perhaps to recall the chief characteristics of 'Crane Lighter No. 4.' The crane is mounted on a pontoon 242 ft. in length and 86½ ft. in breadth. It is capable of lifting its load of 250 tons to a height of 77½ ft. above the level of the sea, and has a reach of 100 ft. radius. The base of the crane rotates and rests upon rollers, which have a path of 50 ft. in diameter.

A large working area

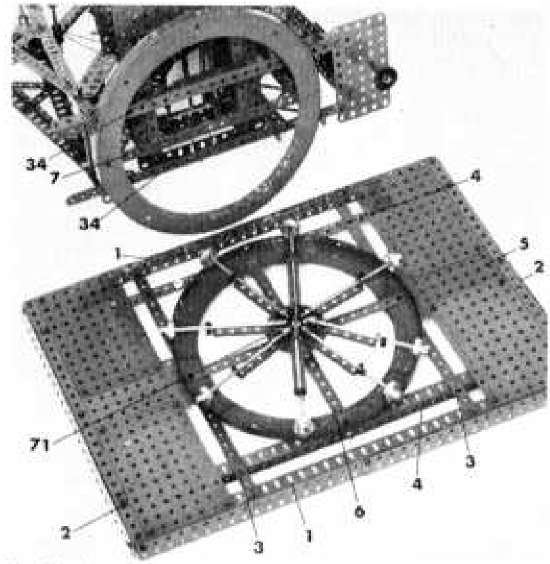
By raising or lowering the jib the reach of the crane is altered thus enabling loads to be picked up from the deck of the pontoon at, say, a reach of 50 ft. swung round and lowered into place at a reach of 100 ft. The crane, as erect as possible, picks up its load and swings round in line with the place where the load is to be dropped. The jib is then lowered, extending the reach of the load as it hangs, until it is immediately over the spot where it is finally deposited.

Hauling is accomplished by steel ropes, the maximum effort being made with the jib inclined at an angle of 40 or 45 degrees to the horizontal. When a heavy load is on, both steam and hydrulic brakes control the movements with wonderful precision.

The Meccano model

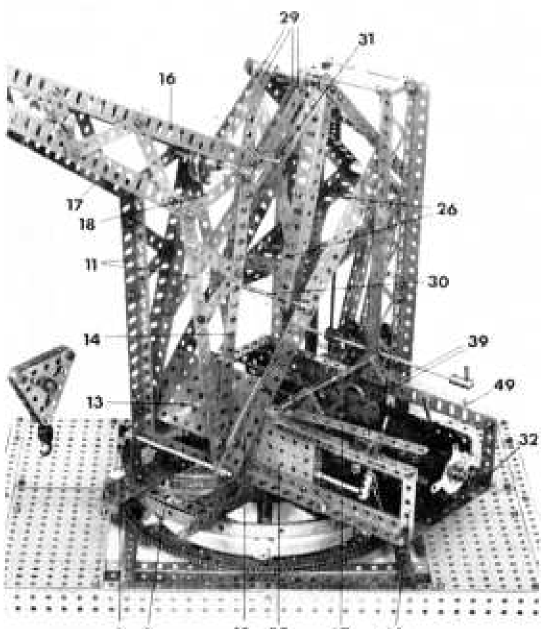
Those of our readers of sufficiently long standing who are able to turn up "M.M." No. 20 and compare the illustration on page 6 with our new Meccano model will be struck by the accuracy and realism of its reproduction in Meccano. Every movement of the original has not only been carefully copied, but identical methods are employed to bring about the required results, with the exception that in the Meccano model electricity takes the place of steam engines as the source of power. . . The model is complete in every detail—the wonderful rocking-bar, giving great leverage and movement at the expenditure of the minimum of effort—the graceful jib, with its two pulley blocks; the wheel and roller race, to minimise friction, and the screw mechanism—by which the jib is raised or lowered—perfectly demonstrated by the Meccano Threaded Rods."

All these comments apply equally to our re-built Crane although I must mention that, whereas the original model employed two Motors, one to drive the hooks and the other the slewing movement, our model uses only one E15R Motor to drive all movements. This requires a slightly more-complicated gear assembly, but it certainly does not make the model anywhere near impossible to build.



In this view of the model the superstructure has been removed from the pontoon to show construction of the pontoon and roller race, both of which are easily built.

A close-up view of the general superstructure. Pay particular attention to the method of joining the jib to the body.



Pontoon

Dealing first with construction of the pontoon, a rectangle is built-up from two 18½ in. Angle Girders 1 and two 12½ in. Angle Girders 2, the former being further joined by two 12½ in. Strips 3 and the latter by another two 18½ in. Angle Girders 4. Two identical Plate arrangements are each produced from two 5½ × 3½ in. Flat Plates connected by a laterally-mounted 4½ × 2½ in. Flat Plate 5, then the finished arrangements are mounted in position on the pontoon. The larger Plates are bolted to Girders 1, while Plates 5 are fixed to respective Strips 3, the securing Bolts also fixing in place a 9¾ in. Flanged Ring crossed by two 9½ in. Strips 6. Flat Girders are bolted to the vertical flanges of Angle Girders 1 and 2.

Superstructure

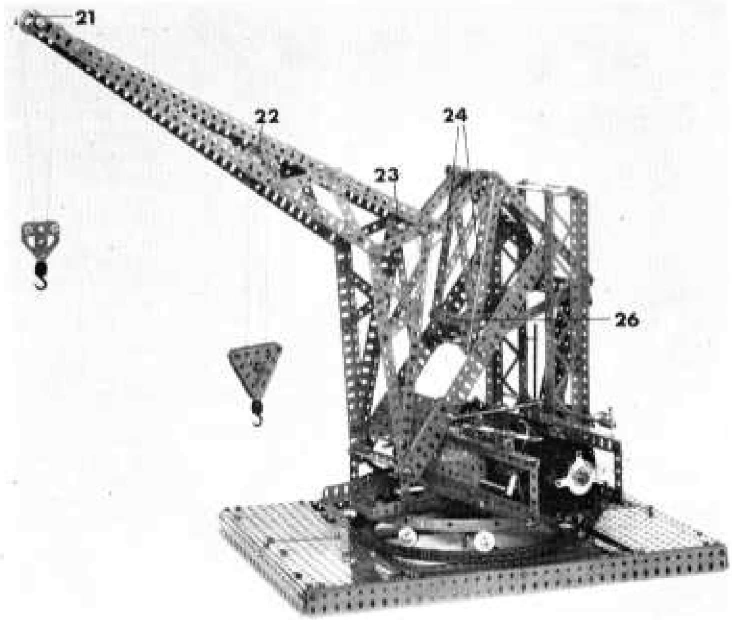
Whereas the pontoon is very simple in design, the superstructure is rather more complicated in that it incorporates no less than six hinge points which enable not only the jib, but also a large section of its supporting superstructure to vary its operating angle. To begin with, a 9½ in. Strip 7 is fixed by two ½ in. Bolts across a 9¾ in. Flanged Ring, the Bolt shanks pointing upwards in the same direction as the flange of the Ring. Held by Nuts on the shank of each Bolt, at right-angles to the Strip, is a 4½ in. Angle Girder 8 which cuts across a section of the Ring, its horizontal flange clamped tight against the vertical flange of the Ring. Bolted to Girders 8 are two 12½ in. Angle Girders 9, separated by a distance of five clear holes.

Now fixed to each Girder 9, through the third and sixth holes are two further 12½ in. Angle Girders 10 joined by a 12½ in. Braced Girder. The upper ends of Girders 10 are, in turn, joined by two 3½ × ½ in. Double Angle Strips to which a 3½ in. Braced Girder is bolted. Also fixed nearer the opposite ends of Girders 9 are two Corner Gussets in which a 4 in. Rod is held by Collars. Mounted on this Rod are two 9½ in. Angle Girders 11, connected by a 3½ in. Strip, and two 12½ in. Flat Girders 12, the other ends of which are bolted to inside Girders 10. Flat Girders 12 are themselves connected by a 3½ × 2½ in. Flanged Plate 13, as shown.

A further 9½ in. Angle Girder 14 is bolted to each Girder 11 through its third hole, the two Girders being held apart further up by a 2½ in. Strip and a 3 in. Strip 15, arranged as shown. Girders 11 are joined by two crossed 5½ in. Strips. Two 18½ in. Angle Girders 16 and 17 are next attached one to the top of Girder 11 and the other to the top of Girder 14, the securing Bolts fixing a 3½ in. Strip 18 between the Girders and at the same time helping to fix a 1½ in. Corner Bracket 19 to the top of Girder 14. Girders 16 and 17 are bolted together at one end, bracing Strips being added further back as shown. Girders 16 at each side are joined by two crossed 3½ in. and two crossed 4½ in. Strips 20, while a 1½ in. Strip is bolted through the third holes from the ends of Girders 17. A 2 in. Rod, carrying a 1 in. loose Pulley 21, is held by Collars in the end holes of these Girders, while similarly held in two of the jib bracing Strips, is a 3 in. Rod carrying two 1 in. loose Pulleys mounted between two 8-hole Bush Wheels 22. An identical Pulley/Bush Wheel arrangement 23 is mounted on a 3½ in. Rod held by Collars in Strips 18.

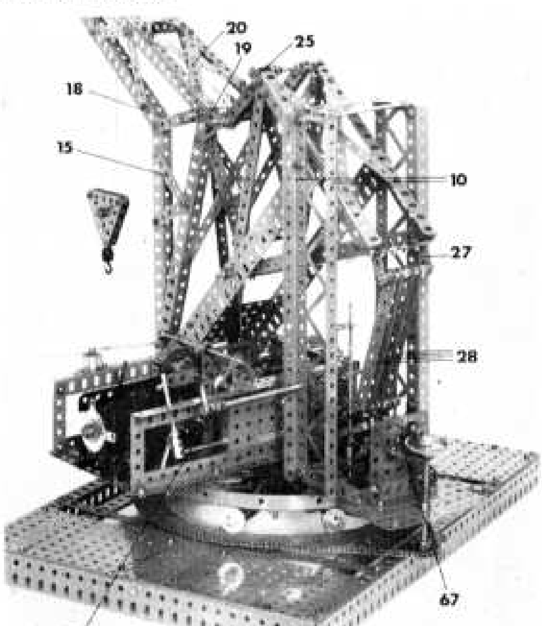
At this stage, two triangular constructions 24 are each built up from three 7½ in. Angle Girders, one of which is extended one hole by a 1½ in. Strip 25. The triangles are then joined by crossed 5½ in. Strips down each side and by an additional 3 in. Strip 26 in two cases. A further 3 in. Strip is bolted to the ends of one pair

The magnificent re-built version of the giant Pontoon Crane which was first featured in the March 1925 issue of Meccano Magazine.



Below, a rear view of the general superstructure showing the relation of the main and secondary gearboxes to each other.

of Girders and to this are fixed two 1 × 1 in. Angle Brackets 27, in the free lugs of which a 2½ in. Rod is journalled. Mounted on this Rod, in order, are four Washers, a Collar, a 5½ in. Strip, a second Collar then a second 5½ in. Strip followed by two more Washers, a further Collar, two further Washers and a third 5½ in. Strip. A fourth Collar and Strip are added, then a final Collar and four last Washers. The Strips, numbered 28 in the accompanying illustrations, must be free to turn on the Rod.



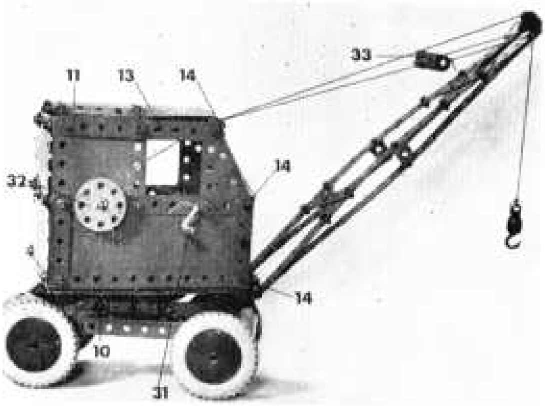
Held by Spring Clips in Strips 25 is a 3½ in. Rod on which four 3½ in. Strips 29, arranged in pairs, are held by Collars. The Strips in each pair are themselves separated by a Collar and, like Strips 28, they must be free to move on the Rod.

The completed triangular box is now positioned in the model, a 4½ in. Rod 30 being passed through the unused corners of the triangles and through the centre holes in Flat Girders 12 to be held by Collars. Strips 29 are then held by Collars on a 3½ in. Rod 31 journalled in Corner Brackets 19, and this should leave Strips 28 dangling at the rear, to be secured later.

Next month's Meccano Magazine concludes the Pontoon Crane. The Motor, Gear, Pulley Blocks and Roller Race assembly are described together with operating instructions.

PARTS REQUIRED:

2—1	2—15a	242—37a	3—76
3—1a	7—16	218—37b	1—94
13—2	4—16a	80—38	1—95a
2—2a	1—16b	1—40	1—96
11—3	2—17	1—45	1—96a
7—4	1—18a	8—48a	1—97
6—5	2—18b	4—48b	2—99
3—6a	8—20b	1—48c	4—103a
6—7a	2—22	2—52	4—103b
8—8	7—22a	5—52a	2—108
10—8a	1—23	1—53	1—109
6—8b	4—24	1—53a	2—111
2—9	6—26	2—57c	4—111a
5—9a	1—26a	62—59	3—111c
1—9d	1—26b	4—62	2—126
1—9f	4—27a	3—63	3—126a
4—12a	2—28	3—63d	2—133
1—13	4—30	2—70	2—167b
3—13a	3—31	1—72	2—173
12—15	10—35	2—73	1—E15R Motor



Built with Meccano Outfit No. 4, this simple Mobile Crane is fitted with full working features.

MOBILE CRANE

by Spanner

A realistic working model built with parts contained in Meccano Outfit No. 4.

PERHAPS MOST frequently featured in Meccano Magazine over the years have been models based on cranes of one sort or another. Some years ago I might have thought that this frequency would bore or even upset readers, but experience has shown that a regular supply of cranes is necessary. This, I have discovered, is because cranes make excellent subjects for Meccano models and, as such, are highly popular with almost everybody. For those who do not share the same tastes, however, and who understandably tend to be disturbed by their frequent appearances, I should point out that not everybody owns a similar-sized Outfit. As we must cater for as many as possible, it means that we must present a good variety of the same type of model, but ranging in size from small to large.

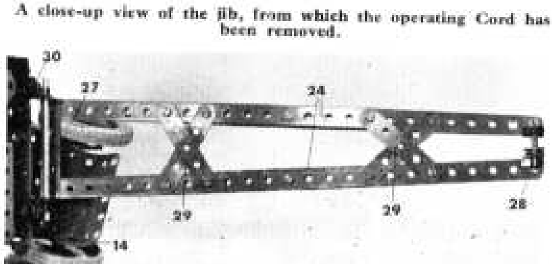
Having explained all this, I can now pass onto the model featured here. Even if you had not seen the accompanying pictures, you will have guessed from the above that it is a crane, the photographs showing it to be one of the mobile sort. Not to be confused with the giant Pontoon Crane described elsewhere, it is, in fact, a very good example of a Mobile Crane which can be built from Meccano Outfit No. 4. The chassis consists of a 5½ × 2½ in. Flanged Plate, to the side flanges of which two Flat Trunnions 1 and two Semi-circular Plates 2 are bolted. Journalled in the centre vertical holes of these are two 3½ in. Rods on the ends of which 2½ in. Road Wheels are mounted, as shown. A 2½ × 1½ in. Flexible Plate 3, attached to the top of the Flanged Plate, projects at one end while a "U" section Curved Plate 4 projects at the other. Also bolted to the top of the Flanged Plate are two ½ in. Reversed Angle Brackets, to the upper lugs of which a 3 in. Pulley 5 is fixed.

Turning, now, to the body, two 4½ × 2½ in. Flat Plates 6 and 7, a distance of one hole separating them, are connected by two 5½ in. Strips 8, then a 3 in. Pulley 9 is bolted beneath them. A cab is next built up separately, each side consisting of a 5½ × 2½ in. Flexible Plate 10, one edged by two 5½ in. and two 2½ in. Strips, and the other just by two 5½ in. Strips. Bolted to Plate 10 are a 2½ × 2½ in. Flexible Plate 11 and a 2½ × 1½ in. Triangular Flexible Plate 12, the tops of which are joined by a 4½ in. compound strip 13, obtained from two 2½ in. Strips. When completed the sides are joined, at the front by three 2½ × 2½ in. Double Angle Strips 14 and a 2½ × 1½ in. Flanged Plate 15, and at the rear corners by a further two 2½ × ½ in. Double Angle Strips. The roof consists of a 2½ × 2½ in. Plastic Plate and a 2½ × 2½ in. Curved Plate 16 attached to the sides by Obtuse Angle Brackets, while the windscreen is a 2½ × 2½ in. Transparent Plastic Plate bolted to upper Double Angle Strip 14.

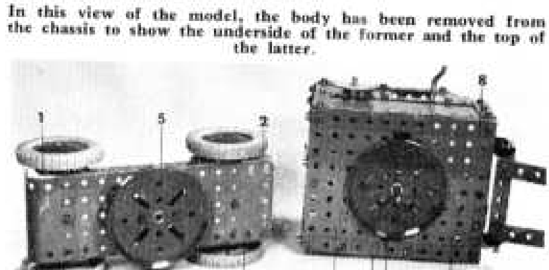
At this stage, the cab is attached to Flat Plates 6 and 7 by Bolts passed through lower Double Angle Strip 14 and the corresponding Double Angle Strip at the rear. Note that the right-hand side of the cab coincides with the right-hand edge of the base formed by Plates 6 and 7, thus leaving some two inches of the Plates free. Bolted in this space are two Flanged Sector Plates 17, one hole separating them. A 5½ × 1½ in. Flexible Plate 18, overlayed by a Trunnion 19 is fixed to the upper flanges of these Sector Plates, while the outside Plate is extended two holes rearwards by a 2½ × 1½ in. Flexible Plate 20. The entire back of the model is then enclosed by a 4½ × 2½ in. Flexible Plate 21, attached by Angle Brackets, and a 2½ × 2½ in. Plastic Plate 22, bolted to Plate 21 and to the upper Double Angle Strip joining the sides of the cab. The rear end of Plate 18 is trapped under a Trunnion 23 bolted to Plate 21.

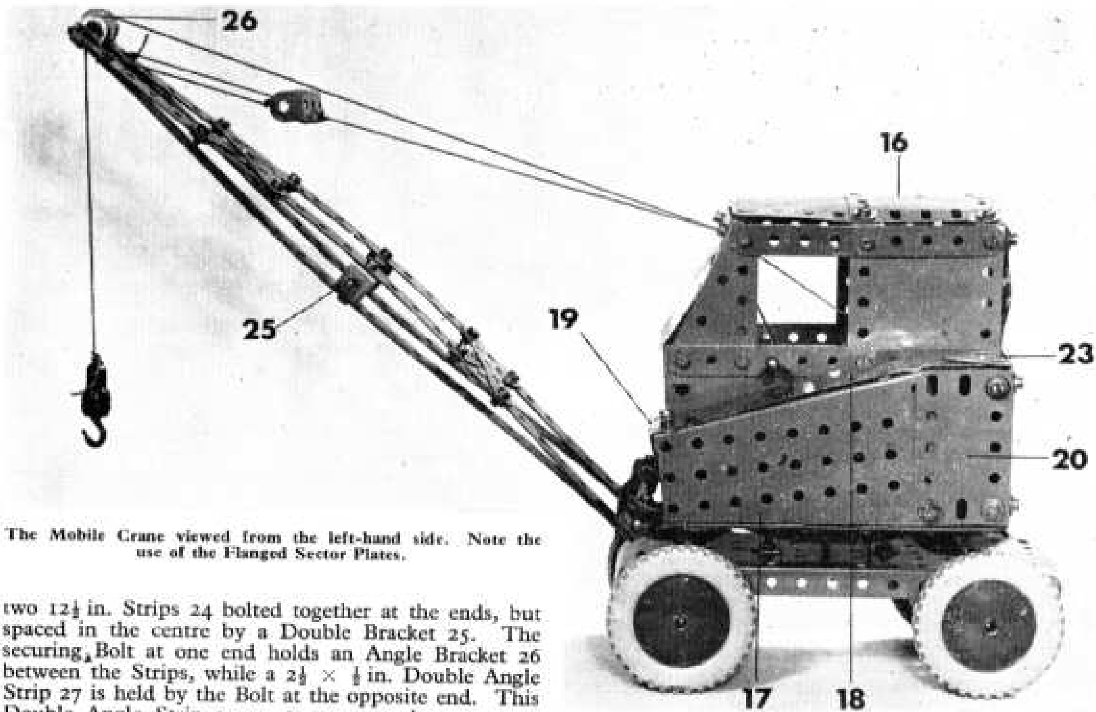
We are now left with the jib, consisting of two arms joined by cross-members. Each arm is built up from

A close-up view of the jib, from which the operating Cord has been removed.



In this view of the model, the body has been removed from the chassis to show the underside of the former and the top of the latter.





The Mobile Crane viewed from the left-hand side. Note the use of the Flanged Sector Plates.

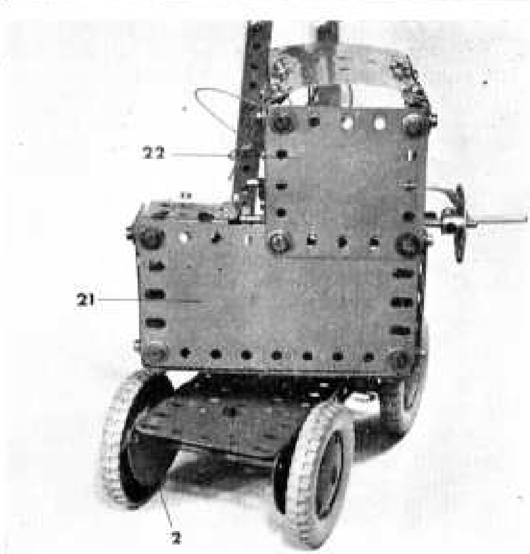
two 12½ in. Strips 24 bolted together at the ends, but spaced in the centre by a Double Bracket 25. The securing Bolt at one end holds an Angle Bracket 26 between the Strips, while a 2½ × ½ in. Double Angle Strip 27 is held by the Bolt at the opposite end. This Double Angle Strip serves to connect the two arms which are also connected at the opposite end by a 1 in. Rod carrying a ½ in. loose Pulley 28 and held by Spring Clips in Angle Brackets 26. The cross-members are supplied by two sets of two 2½ in. Strips 29, bolted as shown between upper Strips 24, then the finished jib is pivotally connected to the body by a 3½ in. Rod, passed through the lugs of Double Angle Strip 27 and held by Spring Clips in Angle Brackets 30. These Angle Brackets are bolted to upward-bent Fishplates which are in turn bolted to Plates 6 and 7.

Two control rods are now added, both being held by a Spring Clip in the upper 5½ in. Strips edging Plates 10. A 3½ in. Crank Handle 31 serves as the first of these, carrying the Hook Cord which is passed over Pulley 28 and threaded through a hole in upper Double Angle Strip 14 to be tied to a Cord Anchoring Spring fixed on the Crank Handle. The other control rod, operating the jib itself, is a 4 in. Rod on one end of which an 8-hole Bush Wheel 32 is mounted. A length of Cord attached to the Rod is also threaded through the hole in Double Angle Strip 14, after which it is tied to the centre of a 1½ × ½ in. Double Angle Strip 33. Short equal lengths of Cord tied to the lugs of this Double Angle Strip are connected to the arms of the jib. A stop for the Rod is supplied by a Bolt held by a Nut in Plates 10. The shank of the Bolt engages with a hole in the face of Bush Wheel 32, therefore the securing Spring Clip on the Rod should be so positioned that it allows the Rod to be slid in its bearings.

Finally, the completed cab and jib assembly is attached to the chassis by a 1½ in. Rod 34 held tight in the boss of Pulley 9. The Rod is passed, free, through the boss of Pulley 5 and the baseplate, being held in position by a 1 in. Pulley fixed on the Rod beneath the Plate.

PARTS REQUIRED:

4—1	1—18b	6—48a	4—187
6—2	2—19b	1—51	2—188
2—3	1—19g	1—52	1—189
8—5	1—22	2—53a	2—190
2—10	1—23	2—54	1—191
2—11	1—24	1—57c	2—192
8—12	6—35	6—111c	1—193a
4—12c	88—37a	2—125	2—194a
1—15b	81—37b	2—126	1—199
3—16	14—38	2—126a	1—200
1—18a	1—48	1—176	2—214
			2—221



A rear view of the model showing the layout of Plates 21 and 22.

at it to know, instinctively, that it's packed with power and the facts would prove you right. Under the bonnet is a massive Chrysler V-8 engine of 6,276 c.c. capacity that develops a maximum power output of 325 b.h.p. at 4,600 r.p.m. to give the car a top speed in excess of 130 m.p.h. A 3-speed automatic transmission system is fitted as standard, but the thing which really sets the F.F. apart from all other cars of its type is the fact that the drive is taken, not just to the rear wheels and not just to the front wheels, but to all four wheels!

Yes, the Jensen F.F. is fitted with the revolutionary new Ferguson Formula 4-wheel drive unit (which presumably accounts for the letters "F.F." in the title of the car). This is a complete break-through in high performance motoring, and makes for greatly increased traction, control and thus safety at fast speeds, as well as improving road performance generally. Safety is further increased by power-assisted steering and an aviation developed anti-skid braking system using Dunlop disc brakes on all four wheels. In short, therefore, the F.F. is a tremendously powerful, fast, but safe car, comfortable to drive in and a dream to look at.

Talking of looks, incidentally, the F.F. is very similar in external appearance to its sister car, the Jensen Interceptor. As far as I can see, in fact, the only obvious differences between the two are the air-intakes built into the front wings. There are two at each side in the F.F., and only one in the Interceptor. The major mechanical differences, of course, are that the Interceptor is not fitted with 4-wheel drive and also usually incorporates a manual gearbox, although automatic transmission is available.

Car transporter

Moving on now, we come to the other new Dinky release, No. 974 A.E.C. Hoyner Car Transporter. This is an articulated model consisting of a double-decked car-carrying trailer coupled to a detachable A.E.C. tractor unit, the trailer being based on a widely-used piece of equipment produced by Hoyner Ltd., of Danbury, Essex. Before describing the trailer, however, I would like to quickly cover the tractor which is, in truth, the existing Dinky Unit. As you may know its features include windows, seats, steering wheel and jewelled headlamps, plus a special de-coupling device actuated by pressing an imitation fuel tank built onto the side of the chassis. This is an extremely useful device as it removes all possibility of the trailer becoming accidentally detached from the tractor, yet it allows them to be easily disconnected at will.

Turning to the trailer, we have a model that works just like the real thing with drop-down loading ramps, lowering top deck and retractable bogey wheels, the last to enable the transporter to be loaded when the tractor is uncoupled. The top deck is raised and lowered by imitation hydraulic rams controlled by a little lever beneath the bottom deck. When loaded the cars are held in place by removable chocks which clip on to the platform beds against the wheels, thus preventing the cars from rolling about.

The correct method of loading the transporter is fairly obvious. First of all the loading ramps are lifted to free them and are dropped down to ground level, then the upper deck is lowered until its rear end rests on the lower deck, its front end angled upwards. Any chocks in position are removed and a car is run up the ramps right to the front end of the deck. Chocks are fitted to hold it in place, then the sequence is repeated until the upper deck is full. Now, the deck is raised to its travelling position and the whole operation again carried out with the lower deck. Using small Dinky Toys such as the Ford Escort or the Mini Minor, the upper deck will hold three models and the lower, two, but, with larger models such as the Ford Zodiac, the capacities are two and two, respectively.

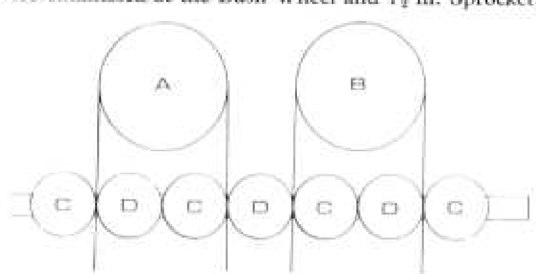
On the model I have, colour finish for the trailer is two-toned with yellow upper deck and orange lower deck and ramps, while the cab is blue with yellow chassis and cream interior. Although not shown in the accompanying illustration, both the tractor and trailer carry "Silcock & Colling Ltd." transfers, this company being one of the largest car delivery firms in the country. All in all, the model is highly realistic and really packed with play-value. You'll have "loads" of fun with it!

Among the Model Builders

with Spanner—still on clocks

CLOCKS SEEM to be something of a habit with me these days! In the last two issues of Meccano Magazine clocks or parts of clocks have been featured in one guise or another, yet I make no apology for kicking off this month with yet another hint for clock builders—this time of the grandfather variety (the clocks, not the builders!). The idea comes from Edward Barklay of Willowdale, Ontario, Canada, who recently wrote to me. "I have found", he said, "That when one builds a model Grandfather Clock a slight swing of the weight is very likely to throw the Chain off the main drive Sprocket. This is even more prone to happen when the clock is of the self-winding type with a heavy weight. The mechanism I have designed (see accompanying diagram) although childishly simple, eliminates all possibility of the Chain jumping off the Sprocket."

"In operation the teeth of the $1\frac{1}{2}$ in. Sprockets just press on the rim of the Bush Wheels, allowing the Chain to pass freely between the two parts, turning only the Sprocket. Any unwanted movement is therefore eliminated at the Bush Wheel and $1\frac{1}{2}$ in. Sprocket,



A mechanism designed by Edward Barklay of Willowdale, Ontario, Canada, to eliminate all possibility of the Sprocket Chain jumping off the drive Sprockets in a weight-driven clock. Key: A—main drive 3 in. Sprocket; B—rewind drive 3 in. Sprocket; C—$1\frac{1}{2}$ in. Sprockets; D—Bush Wheels.

Gerald Hutton of Bexhill-on-Sea, Sussex at work on a self-designed model of a combined shed and greenhouse. See "A builder with a difference."

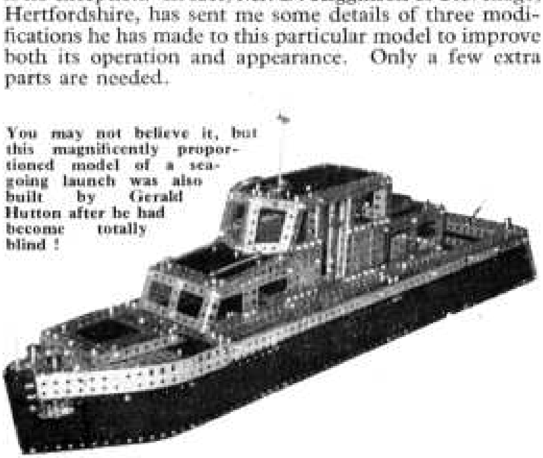
thus leaving the section of Chain between the main Sprocket and the smaller Sprocket and Bush Wheel exactly in line."

Edward's idea is not just a design he has worked out in theory without putting it to practical use, as is sometimes the case, for he goes on to say, "I have the mechanism fitted into a large astronomical clock and it works perfectly even though I am still constructing various parts of the clock." ("The proof of the pudding is in the eating", as the old proverb says!)

Robot modifications

To pass onto a different subject, the majority of Meccano builders produce models from the standard instructions books before they branch out into designing their own constructions. Undoubtedly, one of the most popular "manual models" with more advanced builders is the Robot featured in Leaflet No. 9.7 in the series of Special Model Leaflets for Outfit 9, but, while this model is not particularly difficult to build, it can be a bit tricky to operate successfully. Mind you, Meccano Limited's original model worked very well indeed, but Meccano have never claimed that their models could not be improved upon, and the Robot is no exception. In fact, Mr. D. Higginson of Stevenage, Hertfordshire, has sent me some details of three modifications he has made to this particular model to improve both its operation and appearance. Only a few extra parts are needed.

You may not believe it, but this magnificently proportioned model of a sea-going launch was also built by Gerald Hutton after he had become totally blind!



The first alteration is to the ratchet-type brake mechanism at the rear of each foot preventing the foot from moving backwards when the opposite foot moves forwards. The existing ½ in. Pinion 26 on the rear axle is replaced by a Ratchet Wheel spaced from one side of the foot by a Washer. A Pawl with boss is then mounted free on a ¾ in. Bolt, locked by Nuts in the rear end hole of the same side, the Pawl engaging with the Ratchet Wheel. In other words, the existing built-up pawl-and-ratchet arrangement is replaced by the much more positive "proper" arrangement. A very simple idea, which, as Mr. Higginson puts it, ". . . is solid and really locks the feet when the model is in motion. I found that the method shown in the leaflet slipped and the model tended to fall."

He goes on to say that, "The second improvement is to strengthen the drive to the legs by replacing the two 1½ in. Sprocket Wheels (96) with 1½ in. Sprockets (95a) to which Bush Wheels are bolted. A Bush Wheel is also bolted to the 2 in. Sprocket (95) driving the Rod carrying the upper 1½ in. Sprocket." These Bush Wheels, of course, serve as extra bosses for the Sprockets, thus minimising the danger of the Sprockets slipping on the Rods when fitted with Grub Screws. Note, incidentally, that the Set Screw in the boss of the lower 1½ in. Sprocket must be replaced by a Grub Screw, part 69c, as the head of the Set Screw strikes against the adjacent 5½ × ½ in. Double Angle Strips.

Both the above ideas have been to improve the operation of the Robot, but Mr. Higginson's third and final suggestion is an improvement to its appearance. It consists of nothing more than giving it illuminated eyes which is achieved quite simply by substituting Elektrikit Lamp Holders, with lamps, for the existing 1 in. Pulleys. The Holders are wired in series and connected direct to the terminals of the driving Motor.

The extra parts required to effect all three alterations are as follows:

3—24	2—111	2—539
4—69c	2—147a	2—540
2—95a	2—148	1—558

A builder with a difference

Featured on this page is an illustration showing Gerald Hutton of Bexhill-on-Sea, Sussex, working on a model of a combined shed and greenhouse he has since built. On the face of it you might think that there is nothing unusual about this, and there wouldn't be—except that Gerald has been totally blind for the past two years! Now you know the situation, take another look at the photographs and I think you will agree that the detail and dimensions of the models shown are really amazing under the circumstances.

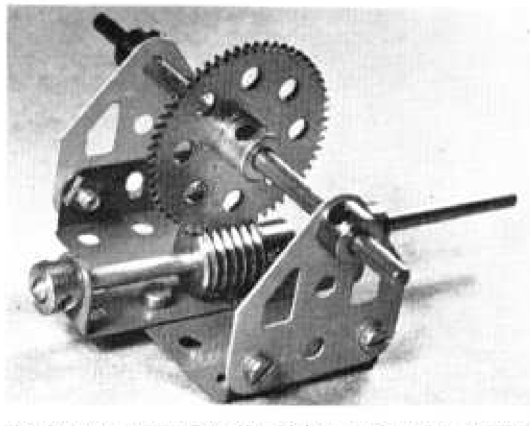
It turns out that Gerald was a keen Meccano enthusiast for something like 18 years until his sight began to fail him. He thought at the time that his model-building days were over as, indeed, they probably would have been if he had not gone to the Blind Rehabilitation Centre in Torquay. There, much to his surprise—and ours, as well—he again came into contact with Meccano, certain parts being used to help in the work of the Centre. Gerald stresses, incidentally, that the Centre is not a training school in that members do not go straight onto work when they leave. It is, he points out, purely a rehabilitation centre where blind people are taught self-confidence and are shown that they can become ordinary, hard-working members of society. This is where Meccano comes in handy.

Mind you, members do not build models in the accepted sense, but are given patterns constructed from various Strips, Plates and Girders which they must copy. "I believe the whole idea of the exercise", says Gerald, "Is to find out how we can work out the shapes of a pattern, and then copy it". It is done, he goes on to say, "More or less on the same lines as the assembly line in a factory," and he adds that "I must admit all this is a jolly good idea to see how patient one is when confronted with the various patterns."

The "Meccano Section" is only a small part of the excellent work done down at the Blind Rehabilitation Centre in Torquay, but it was sufficient to show Gerald Hutton that he could still enjoy his old hobby. The accompanying pictures prove how successful he has been and, in addition to the models shown, he has built numerous others from the old-style Instructions Manuals containing written building instructions. How does he do it?—By copying the instructions in Braille and working out mental illustrations to go with them. That's genuine skill!

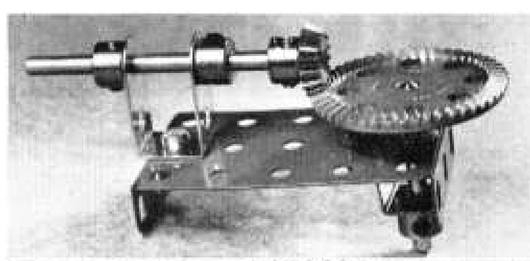
DRIVE ON

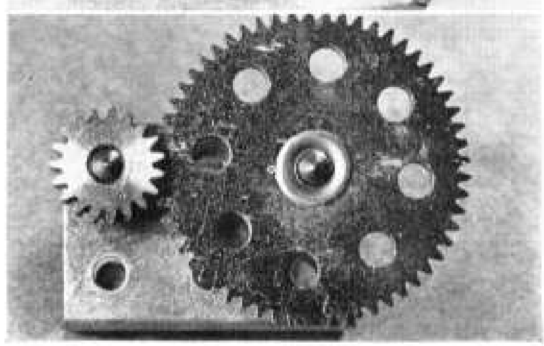
Spanner looks at the methods and linkages used in the driving of Meccano models



The Meccano Worm Gear No. 32 has a rating of 1, therefore, when it is meshed with a Gear, you immediately have a ratio as high as the number of teeth on the Gear. Here, we see a Worm meshing with a 57-teeth Gear to result in a 57 : 1 ratio.

Below, top, a positive method of obtaining a right-angled drive is to use bevel gearing. Here we have a Meccano Bevel Gear 30a (16-teeth) meshing with Gear 30c (48-teeth) to give such a drive and, at the same time, a gear ratio of 3 : 1. Next, a gear ratio of 3 : 1 obtained by meshing a ½ in. Pinion (19-teeth) No. 26 with a 57-teeth Gear, No. 27a. These are two of the most frequently used gears in the Meccano system.





WHENEVER I feature working models in the M.M. I describe, almost in passing, how they are driven: X is connected to Y; this Pinion meshes with that Gear, and so on—stark building instructions, all, without any theory to explain why it is done. This is as it should be in constructional articles, but it's worth pausing here to take a general look at the various methods of driving or, more correctly, the various methods of transmitting drive in Meccano models. "Transmitting" is the operative word because, as far as Meccano is concerned, there are only two actual drive sources—manual and motor.

For the purposes of this article, the drive source is not important. What we are interested in is how the drive is taken from the source to the point where it is applied, and what happens to the power on the way. Generally speaking there are four basic types of drive—direct, belt, chain and gear. Of these, the last three are closely related to the final output power as well as the speed of the drive system, as we shall see.

Direct drive

First, however, let us look at the direct drive system which is certainly the most simple in operation, at the same time being the most limited in use. Direct drive is where the output shaft of the drive source, or an extension of the output shaft, serves also as the final drive for the operation being carried out. Assume, for example, that you have a simple crane in which the hook cord winding drum is provided by a Rod coupled direct to the output shaft of a Motor. This is direct drive as also are the manual winding operations in the Mobile Crane featured on page 498 of this issue. Here, the power source is the operator, the final output shaft being the Crank Handle or jib control Rod, as the case may be. The drive is therefore direct from the operator to the Rod or Handle.

Belt drive

If direct drive is limited in use, however, perhaps the most frequently used drive method—particularly in smaller models—is the belt system. This, one of the oldest forms of drive transmission, is where a Pulley on the output shaft of the power source is connected to another Pulley on a second shaft by an "endless" belt, usually represented in Meccano models by a rubber Driving Band or a length of Cord with its ends joined. Immediately a minimum of two Pulleys have been introduced into the system it becomes possible to vary its final output power and speed by using Pulleys of different diameters. Imagine for instance, that the power source is a Meccano Motor and a ½ in. Pulley, Part No. 23a, on its output shaft is connected to, a 2 in. Pulley, No. 20a, on the final shaft of the system. The circumference of the 2 in. Pulley is four times greater than the circumference of the ½ in. Pulley, therefore the ½ in. Pulley will need to revolve four times in order to turn the 2 in. Pulley through one revolution. This results in a step-down reduction ratio of 4 : 1 between the Motor output shaft and the final drive shaft. If, on the other hand, the positions of the Pulleys were reversed, then the resulting effect would be a step-up ratio of 1 : 4 causing the final drive shaft to revolve four times faster than the output shaft of the Motor. A step-up ratio is fairly unusual in Meccano model-building, however, for reasons we shall study more closely when we look at gear drives.

Chain drive

While a belt drive is suitable for small or at least uncomplicated models, it has the disadvantage of possible "slip" between the belt and the Pulleys. Consequently it cannot be fully relied on to give a positive and accurate drive when the ratio to be produced is of critical importance—and this is where chain drive is invaluable. Meccano Sprocket Wheels and Chain serve the same purpose as the Pulley and belt system with the one important difference that, if mounted correctly, there is no slip between the Chain and the Sprockets. It therefore follows that the Sprocket on one Rod can be used to drive the Sprocket on another Rod at a definite rate.

Included in the Meccano system are five Sprocket Wheels, numbered 95, 95a, 95b, 96 and 96a, all of different diameters and all with a different quantity of teeth ranging from 56 down to 14. By using a combination of Sprocket sizes suitable step-up or step-down ratios can be obtained, the particular ratio being determined by the number of teeth on the Sprockets. For example, Part No. 96, with 18 teeth, connected to Part No. 95, with 36 teeth, would give a ratio of 2 : 1.

Turning to the Sprocket Chain, itself, this is numbered 94 and is supplied in 40 in. lengths with six links to the inch. When the required length for a particular job has been measured off, it can be easily separated by gently prising open the ends of one of the links with the blade of a screwdriver until the adjacent link can be slipped out. After rejoining, the ends of the opened link are carefully bent back again, care being taken to ensure that they do not grip the next link too tightly. The Chain should be passed around the Sprockets with the turned-over ends of the links facing outwards away from the Sprockets, as this will result in smoother running. Note that, in place, the chain must not be completely taut, but should have a very small amount of "play" in it to keep friction to a minimum.

Gear drive

We come now to gearing which is by far the most interesting and accurate method of transmitting drive in Meccano. First, however, let us take a look at the basic types of gears in general use today, of which there are five—spur, contrate, bevel, helical and worm. Of these, perhaps the most common are spur gears, used to transmit drive from one shaft to another running parallel to it. The Meccano range of spur gears includes Pinions numbered 25, 25a, 25b, 26, 26a, 26b, and 26c, plus Gear Wheels 27, 27a, 27b, 27c, 27d and 31. Remember though, that as far as working-out ratios is concerned, Pinions 25, 25a and 25b can really only be counted as one gear, all having a similar diameter and number of teeth. In fact, the only difference between them is their width or "face", the same thing applying to Pinions 26, 26a and 26b.

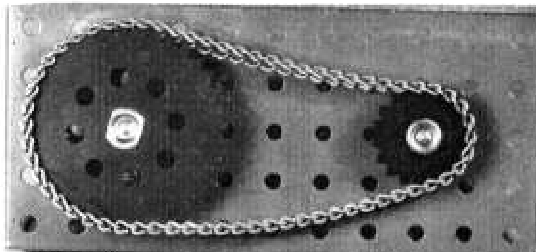
Bevel gears (represented in Meccano by Parts 30, 30a and 30c), contrate gears (represented by Parts 28 and 29), helical gears (Parts 211a and 211b) and worm gears (Part 32) all serve a similar purpose in that they are used to drive shafts positioned at right-angles to each other. Here the similarity ends, however. A Contrate is usually meshed with a Pinion, whereas Bevel Gears, like Helical Gears, can only be used together. Alternatively, a Contrate will mesh with a Pinion and a pair of Bevels with each other only when the Rods on which they are mounted are at right-angles to each other in the same plane. Helical Gears, on the other hand, will only mesh when the supporting Rods pass one at right-angles to the other in a different plane, this also applying to the Worm which will mesh both with Pinions and Gear Wheels.

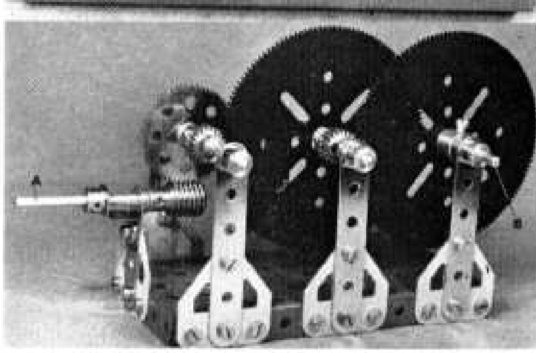
Differences aside, it is gearing which really makes it possible to accurately increase or decrease the final output speed of a mechanism. If, say, a ½ in. Pinion with 19 teeth on one shaft is meshed with a 57-teeth Gear on a second shaft, a 3 : 1 reduction ratio will result, the second shaft revolving at one-third the speed of the first shaft. If the positions of the gears are reversed a step-up ratio of 1 : 3 results causing the second shaft to revolve three times as fast as the first shaft. As with Sprocket and Chain drive the ratio of any two meshing spur, bevel, contrate or helical gears is discovered by dividing the number of teeth on the smaller gear into the number of teeth on the larger.

If, in the above example, the speed reduction was insufficient for the job on hand, a second stage could be added. Suppose, in addition to the Gear, another ½ in. Pinion was mounted on the second shaft and meshed with a second 57-teeth Gear on a third Rod. A further 3 : 1 reduction would result between the second and third shafts therefore the overall reduction between the first and third shafts would be 9 : 1, a figure obtained by multiplying the two 3 : 1 ratios together. If a similar third stage were added, the overall ratio would be 27 : 1, thus: $3 \times 3 \times 3 = 27$. This type of arrangement employing more than a single stage (two gears) is known as a compound gear train.

So far we have been looking at gears in relation to speed but it is a matter of mechanical fact that a gear train also has a direct effect on power, the increase or decrease in power being inversely proportional to the increase or decrease in speed. To give an example, if a 3 : 1 reduction-ratio gear train, such as our first example above, was coupled to a Motor, the speed of the second shaft would be one-third that of the Motor

At right, top. An example of chain drive using Meccano Sprocket Wheels 95 (36 teeth) and 96 (18 teeth) connected by Sprocket Chain 94. A ratio of 2 : 1 results. Next, an example of a 3-stage compound gear train which gives the enormous reduction ratio of 2793 : 1 between the input shaft A and the output shaft B. The input shaft must revolve 2,793 times to turn the output shaft once, but the power at the output shaft is 2,793 times greater than at the input shaft.





output shaft, but the power output of the second shaft would be three times greater than the Motor shaft. In mechanical terms, for a reduction ratio of 3 : 1, the power ratio is 1 : 3 and this direct reversal always applies, no matter what the ratio.

By the same token, of course, if a step-up ratio of 1 : 3 is coupled to a Motor, the power ratio will be 3 : 1, meaning that the power output of the second shaft will be one-third that of the Motor shaft. For this reason, step-up ratios are rarely used in Meccano model-building, where the object of gearing is almost always to obtain increased power by "stepping-down." In many cases, in fact, the amount of reduction required is so great that, if ordinary Pinions and Gears were used, a multi-stage gearbox would be necessary—and this is where the Meccano Worm Gear comes in handy! This has a rating of 1, therefore, when it is meshed with a Gear, you immediately have a reduction ratio as high as the number of teeth on the Gear. If meshed with the popular 57-teeth Gear, for instance, the resulting ratio is 57 : 1 and with this sort of figure to start with you can soon increase the ratio enormously in very few stages.

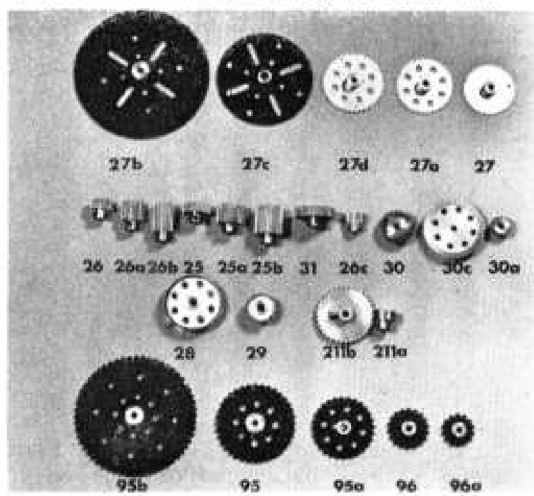
Let us take an imaginary case starting with 57 : 1 and including only two more additional stages using a ½ in. × 19-teeth Pinion meshing with a 3½ in. × 133-teeth Gear Wheel in each case. The ratio between each Pinion and Gear is 133 divided by 19 giving 7 : 1. To find the combined ratio of the three stages we multiply the three separate ratios together, thus: 57 × 7 × 7. The final ratio, therefore is a staggering 2793 : 1! If you coupled the gear train to a Motor, the final shaft would turn very slowly, but just imagine the tremendous power it would have!

A few words now on things to look out for when fitting gearing to Meccano models. The most frequently used items in the range are the standard Pinions, numbered 25 to 26c, and the standard Gear Wheels, 27 to 27d. These of course have different diameters whereas the holes in Meccano Strips and Plates, etc., are spaced regularly every half-inch. Consequently some parts when mounted in line will not mesh with others. The rule, therefore, is that *Pinions and Gears will only mesh if the combined diameters of any two Parts add up to the round inch or half-inch.* For example, a ¾ in. Pinion will mesh with a 1¼ in. Gear because their combined diameters add up to a round 2 in., but the same Pinion will not mesh with a 1½ in. Gear because the sum of their diameters is 2¼ in. In the same way, a ½ in. Pinion 26 will engage with a 2½ in. Gear 27c, but not with a 1½ in. Gear 27. Note that the 7/16th in. Pinion No. 26c will mesh only with the 60-teeth Gear No. 27d, and vice versa.

Finally, all Meccano gears, excluding the Worm, are reversible meaning that they can be used either as the driving or the driven gear. The Worm, however, cannot be driven by another gear and therefore *must always be used as the driver in any gear mechanism.*

MECCANO GEARS AND SPROCKETS

Part No.	Description
25	¾" diam. Pinion, ½" face, 25 teeth
25a	¾" " " ¾" " 25 "
25b	¾" " " 1" " 25 "
26	½" " " ¼" " 19 "
26a	½" " " ½" " 19 "
26b	½" " " ¾" " 19 "
26c	7/16" " " ¼" " 15 "
27	1½" diam. Gear Wheel, 50 teeth
27a	1½" " " " 57 "
27b	3½" " " " 133 "
27c	2½" " " " 95 "
27d	1 9/16" " " " 60 "
28	1½" diam. Contrate Wheel, 50 teeth
29	¾" " " " 25 "
30	⅞" diam. Bevel Gear, 26 teeth
30a	⅝" " " " 16 "
30c	1½" " " " 48 "
31	1" " Gear Wheel, ½" face, 38 teeth
32	⅞" diam. Worm Gear
95	2" diam. Sprocket, Wheel, 36 teeth
95a	1½" " " " 28 "
95b	3" " " " 56 "
96	1" " " " 18 "
96a	¾" " " " 14 "
211a	½" " Helical Gear
211b	1½" " " "



The Gears, Pinions and Sprocket Wheels contained in the Meccano system excluding No. 32 Worm Gear. See the list above for descriptions of the parts.